Sequoyah Nuclear Plant

8005140 444

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SPECIAL TEST NO. 5

NATURAL CIRCULATION AT REDUCED PRESSURE

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PORC Review: 5/6/80
Date

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Date Approved: 5/6/80

Rev. No.	Date	Revised Pages	Rev. No.	Date	Revised Pages
0	5/6/80	All			

The last page of this instruction is Number 48

SPECIAL TEST NO. 5

NATURAL CIRCULATION AT REDUCED PRESSURE

NATURAL CIRCULATION AT REDUCED PRESSURE

Table of Contents

TEST DESCRIPTION

The reactor coolant pumps are tripped with the reactor at 3% of rated power. The reactor coolant system is depressurized by turning off the pressurizer heaters and possibly turning on auxiliary sprays. Reactor power is reduced to 1.5% per hour after the pumps are tripped to approximate decay heat conditions. Saturation margin is monitored and increased charging and/or steam flow is used to maintain test limits.

SPECIAL OPERATOR INSTRUCTION

*An operator initiated safety injection should be performed only for one or more of the following conditions:

Reactor coolant system subcooling	≤ 10°
Sudden unexplained decrease in pressurizer level of or to an Indicated Level of	10% ≤ 10%
Sudden unexplained decrease in any S/G level to	≤ 76% Wide Range ≤ 0% narrow range
Unexplained pressurizer pressure drop	≥ 200 PSI
Containment pressure Hi - (1.54 psig)	Annunciator XA-55-6B Window 6 initiates

An operator initiated reactor trip should be performed for any of the following conditions:

Reactor coolant system subcooling	≤ 15°
Sudden unexplained decrease in pressurizer level of or to an Indicated Level of	5% ≤ 17%
1/3 excores	≥ 10%
Any Loop Δ T	> 65°F
Tavg	> 578°F
Core Exit Temperature (Highest)	> 610°F
Any Uncontrolled Rod Movement	

*SI termination should be in accordance with plant EMERGENCY OPERATING PROCEDURES.

1.0 OBJECTIVES

1.1 Verify the ability to maintain natural circulation at reduced RCS pressures.

1.2 Verify the accuracy of the saturation margin indication from the plant computer.

1.3 Provide operational experience at lower saturation margins and the affects of charging and secondary steam flow on the control of the saturation margin.

1.4 To provide operator training, all shifts will perform this test.

NOTE: Data acquisition does not need to be repeated for multiple test performances.

2.0 PREREQUISITES

NOTE: This test can be done in conjunction with Test III, Natural Circulation With Loss of Pressurizer Heaters.

2.1 The reactor is critical at ~ 3% power and under manual control with control bank D at ~ 160 steps or as specified by Test Engineer. (Power determined as indicated in Appendix C.)

_____ _____
Date

2.2 All four reactor coolant pumps in operation.

_____ _____
Date

2.3 Steam generator level maintained at approximately 33% on the narrow range indicators by the auxiliary feedwater pumps.

_____ _____
Date

2.4 Pressurizer pressure and level being maintained automatically at approximately 2235 psig and 27% respectively.

_____ _____
Date

2.5 RCS temperature (Tavg) approximately 550°F.

_____ _____
Date

2.6 Low Power Physics Test Program has been completed to the extent necessary for conduct of this test.

_____ _____
Date

2.7 Steam generator pressure at approximately 1000 psig and being maintained by steam dump to the condenser on pressure control.

_____ _____
Date

2.0 PREREQUISITES (Continued)

2.8 Connect recorders to the following test points:

NOTE: Data acquisition need not be repeated for multiple test performances. N/A signoff for these steps.

Recorder 1	Connect To:	Monitoring:
Channel #1	1-R-1, FP414B	RCS Flow-Loop 1
Channel #2	1-R-1, FP424B	RCS Flow-Loop 2
Channel #3	1-R-1, FP434B	RCS Flow-Loop 3
Channel #4	1-R-1, FP444B	RCS Flow-Loop 4
Channel #5	1-R-1, PP455B	Pressurizer Pressure
Channel #6	1-R-1, LP459B	Pressurizer Level

Recorder 2	Connect To:	Monitoring:
Channel #1	1-R-23, LP501	Steam Gen. #1 Level
Channel #2	1-R-3, FP512B	Steam Gen. #1 Steam Flow
Channel #3	1-R-3, PP514B	Steam Gen. #1 Pressure
Channel #4	1-R-23, LP502	Steam Gen. #2 Level
Channel #5	1-R-3, FP522B	Steam Gen. #2 Steam Flow
Channel #6	1-R-3, PP524B	Steam Gen. #2 Pressure

Recorder 3	Connect To:	Monitoring:
Channel #1	1-R-23, LP503	Steam Gen. #3 Level
Channel #2	1-R-4, FP532B	Steam Gen. #3 Steam Flow
Channel #3	1-R-4, PP534B	Steam Gen. #3 Pressure
Channel #4	1-R-23, LP504	Steam Gen. #4 Level
Channel #5	1-R-4, FP542B	Steam Gen. #4 Steam Flow
Channel #6	1-R-4, PP544B	Steam Gen. #4 Pressure

Recorder 4	Connect To:	Monitoring:
Channel #1	1-R-18, FP121A	RCS Charging Flow
Channel #2	1-R-23, FP132	RCS Letdown Flow
Channel #3	1-R-5, PP403A	Wide Range RCS Pressure
Channel #4	1-R-22, TP454	Pressurizer Steam Temp
Channel #5	1-R-20, TP453	Pressurizer Liquid Temp.

Recorder #5	Connect To:	Monitoring
Channel #1	L-3-163, TP13, 1-L-11B	Aux Feed Flow to S.G. #1
Channel #2	L-3-155, TP13, 1-L-11A	Aux Feed Flow to S.G. #2
Channel #3	L-3-147, TP12, 1-L-11B	Aux Feed Flow to S.G. #3
Channel #4	L-3-170, TP12, 1-L-11A	Aux Feed Flow to S.G. #4

2.0 PREREQUISITES (Continued)

NOTE: Record the following on each recorder chart.
a) Unit #
b) Date
c) Procedure #
d) Parameter Scale and Range
e) Chart Speed
f) Name of person recording data
g) Recorder I.D. #

2.9 Record on ρ-computer recorder

a) Flux
b) Average wide-range T_{cold}
c) Average wide-range T_{hot}
d) Average steam-generator pressure
e) Reactivity

_____ _____
Date

2.10 Set the trend recorders and computer trend printer in the main control room to monitor the parameters indicated in Appendix D.

_____ _____
Date

NOTE: Data acquisition need not be repeated for multiple test performances. N/A signoffs for these steps.

2.11 Verify the input logic of safety injection on Hi Steam Line ΔP has been blocked in accordance with Appendix E.

_____ /

2.12 Verify the Hi Steam Flow coincident with Lo S/G pressure or Lo Tav input to Safety Injection has been modified in accordance with Appendix E.

_____ /

2.13 Verify the automatic actuation of Safety Injection has been blocked in accordance with Appendix E.

_____ _____ /

2.0 (Continued)

2.14 Verify the following UHI isolation valves are gagged:

FCV 87-21 _____/_____

FCV 87-22 _____/_____

FCV 87-23 _____/_____

FCV 87-24 _____/_____

2.15 Intermediate and power range (low setpoint) high level reactor trip setpoints have been set to 7% in accordance with Appendix C and D of SU-8.5.2.

Power Range _____/_____

Intermediate Range _____/_____

3.0 PRECAUTIONS

3.1 Maintain reactor coolant pump seal and thermal barrier differential pressure requirements as given in SOI 68.2.

3.2 Do not exceed 5% nuclear power at any time while the test is in progress.

3.3 Abort test if any of the following temperature limits are exceeded:

3.3.1 Core exit temperature of 610°F.

3.3.2 ΔT as indicated by $T_H - T_C$ of 65°F.

3.3.3 T_{avg} Temperature of 578°F.

3.4 When equilibrium has been established after the initial transient, avoid any sudden changes in feedwater flow or in steam generator water level.

3.5 After the reactor coolant pumps are tripped the normal T_{avg} and ΔT indications will be come unreliable. ΔT and T_{avg} should be calculated by taking the difference and the average of the hot and cold leg temperature indications respectively.

3.6 Maintain saturation margin greater than 20 degrees Fahrenheit at all times.

3.7 Monitor reactor power closely whenever adjustments to T_{cold} are made. Maintain T_{cold} above 531°F.

3.0 (Continued)

3.8 Should a reactor trip occur during the conduct of this test, at least one reactor coolant pump (#2) should be started prior to closing the reactor trip breaker.

3.9 Maintain D bank at ≥ 100 steps during the conduct of this test. Should this limit be reached, boron concentration will have to be increased.

3.10 When RCS pressure drops below 1970 psig, manually block S. I. (setpoint at 1870 psig). If not blocked, the reactor will trip when the setpoint is reached.

3.11 When RCS pressure is dropped below 1970 psig, isolation valves for pressurizer PORV's should be closed.

4.0 SPECIAL TEST EQUIPMENT

Instrument	Specification	Identification	Calibration Verification
Strip Chart Recorder (4)	Brush 260 or equivalent		
Reactivity Computer	Westinghouse		
Recorder (1)	HP 7100B or Equivalent		

If test instruments are changed during this test, the instrument information must be recorded here and an entry made in the chronological log book explaining this change.

5.0 TEST INSTRUCTIONS

NOTE: Data acquisition need not be expected for multiple test performance. N/A signoffs for these steps.

5.1 Ensure the pressurizer backup heaters 1A, 1B, and 1C remain off by moving handswitches 1-HS-68-341A and 341D to the 'Stop' position and moving 1-HS-68-341H to 'Stop-Pull to Lock'.

_____ /

5.2 Record the data indicated on Data Sheet 5.1.

_____ /

5.3 Start the computer trend printer printing at the fastest interval possible.

_____ /

5.4 Shutoff the pressurizer control heater group by moving 1-HS-68-341F to 'Stop'.

_____ /

5.5 Record the time, on the data recorder charts in the auxiliary instrument room and then start them at 125mm/min.

_____ /

5.6 Shutdown the reactor coolant pumps in accordance with SOI-68.2 (simultaneously).

_____ /

NOTE: At the initiation of natural circulation the following temperature response is expected.

a) Wide range T_{hot} - increase
b) Wide range T_{cold} - slight increase or constant
c) Core exit thermocouple - increase
d) T_{avg} indication - unreliable
e) Delta-T indication - unreliable
f) Pressurizer level and pressure - increase

5.7 Verify natural circulation is established by following the operational guidelines given in Appendix A of EOI-5.

_____ /

5.0 TEST INSTRUCTIONS (Continued)

NOTE: Natural Circulation will be stable when:
1) ΔT between wide range T_{hot} and T_{cold} is constant.
2) ΔT between wide range T_{cold} and core exit thermocouple average temperature is constant.
3) Wide range $T_{hot} \cong$ core exit thermocouple average temperature.
(See Table 1)

5.7.1 Assume manual control of charging flow and match charging to letdown to maintain a constant RCS water mass. (Hold pressurizer level ~ constant after equilibrium is reached on natural circulation).

_____ /

5.8 Once equilibrium has been established adjust trend printer printout intervals as specified by the test director.

_____ /

NOTE: A slow cooling of the pressurizer will begin at this point and a corresponding decrease in RCS pressure.

5.9 Record the highest T/C temperature indicated on the T/C maps, the lowest of the four pressurizer pressure protection channels, and the saturation margin indicated on the analog trend recorder on data sheet 5.3 at periodic intervals during the depressurization.

_____ /

NOTE: If desired, the depressurization rate can be increased by using auxiliary spray. Once the RCS pressure drops below 1700 psig, the pressure reading for Data Sheet 5.3 should be taken from the RCS wide range pressure indicators.

CAUTION: Safety injection must be manually blocked when RCS pressure drops below 1970 psig. (To prevent a reactor trip).

5.10 After the RCP trips, begin slowly reducing reactor power to approximately 1.5% and maintain this power level for the duration of the test. (Reduce power at a rate of ~ 1.5% per hour).

_____ /

5.10.1 When RCS pressure drops below 1970 psig, close the isolation valves for the pressurizer PORV's by placing their respective handswitches in the 'close' position.

_____ /

5.0 TEST INSTRUCTIONS (Continued)

5.11 Continue to monitor the core exit T/C temperature to verify natural circulation is maintained as the saturation margin is decreased. Continue pressure drop until the test director indicates sufficient data has been recorded to verify the accuracy of the saturation margin indicated on the trend recorder. Increase charging and/or steam flow to increase the saturation margin at this time.

_____ /

NOTE: Do not allow the saturation margin to decrease below 20°F. The margin can be increased by either increasing RCS pressure or reducing T_{cold}. Charging must be increased to maintain pressurizer level and pressure when reducing T_{cold}. Do not allow pressurizer level to go above 70%.

5.12 Using 1967 ASME steam tables, determine the saturation margin using the pressure and temperature recorded in Data Sheet 5.3 and plot this value along with the saturation margin taken from the analog trend recorder vs time on Data Sheet 5.4.

_____ /

NOTE: Step 5.12 can be conducted concurrent with the depressurization.

5.13 Increase the saturation margin back to above 50°F and stop the brush recorders and trend printers. Attach copies of the printouts and charts to Data Sheet 5.2.

_____ /

5.13.1 When RCS pressure is increased above 1970 psig, open the isolation valves for the pressurizer PORV's.

_____ /

5.14 An evaluation of the accuracy of the saturation meter should be done at this time to determine the necessity of reprogramming the computer. The computer trend should indicate a saturation margin within 3% of the margin determined from the steam tables.

_____ /

5.15 Increase RCS pressure back to 2235 by selectively energizing the pressurizer backup heaters.

_____ /

5.16 Insert control bank D until the reactor is in the hot zero power test range.

_____ /

5.0 TEST INSTRUCTIONS (Continued)

Caution: Ensure pressurizer spray controllers are at zero output prior to starting the first reactor coolant pump.

5.17 Restart all four reactor coolant pumps in accordance with SOI 68.2 beginning with 2, 1, 3 and then 4.

_____ / _____

5.18 Return pressurizer level to approximately 27% and return RCS pressure and level control to automatic.

_____ / _____

NOTE: Conditions can now be established for the conduct of the next test.

5.19 Remove the block of input logic of Safety Injection on Hi Steam Line ΔP in accordance with Appendix E unless the next test to be performed requires the block to be installed. If this is the case, disregard this step. Place N/A in the signature line and initial.

_____ / _____

5.20 Remove modification to Hi Steam Flow coincident with Lo S/G pressure or Lo Tav input to Safety Injection in accordance with Appendix E, unless the next test to be performed requires the modification to be made. If this is the case, disregard this step, place N/A in signature line and initial.

_____ / _____

5.21 Remove block of automatic initiation of Safety Injection in accordance with Appendix E, unless the next test to be performed requires the modification to be made. If this is the case, disregard this step, place N/A in the signature line and initial.

_____ / _____

5.22 Remove the gag from the following UHI isolation valves unless the next test to be performed requires the valves to be gagged. If this is the case, disregard this step, place N/A in the signature line and initial.

FCV 87-21 _____ / _____

FCV 87-22 _____ / _____

FCV 87-23 _____ / _____

FCV 87-24 _____ / _____

5.0 TEST INSTRUCTIONS (Continued)

5.23 Reset the intermediate and power range high level reactor trip setpoints as indicated by the test director in accordance with Appendix C and D of SU-8.5.2 unless the next test to be performed requires this adjustment. If this is the case, disregard this step, place N/A in the signature line, and initial.

Power Range _____ / _____

Intermediate Range _____ / _____

6.0 ACCEPTANCE CRITERIA

6.1 Core exit T/C temperatures does not exceed 610°F.

_____ / _____

6.2 Delta-T for any loop does not exceed 65°F.

_____ / _____

6.3 T_{avg} for any loop does not exceed 578°F.

_____ / _____

6.4 Natural circulation can be established and maintained at reduced low RCS pressure.

_____ / _____

6.5 The plant computer calculated saturation margin is in agreement with margins determined using recorded plant parameters within ± 3%.

_____ / _____

DATA SHEET 5.1

Initial Conditions

Unit _____ Time _____ Date _____

Pressurizer Pressure PR-68-340	_____ psig
Pressurizer Level LR-68-339 Red Pen	_____ %
#1 Hot leg temp TR-68-1	_____ °F
#1 Cold leg temp TR-68-18	_____ °F
#2 Hot leg temp TR-68-1	_____ °F
#2 Cold leg temp TR-68-18	_____ °F
#3 Hot leg temp TR-68-43	_____ °F
#3 Cold leg temp TR-68-60	_____ °F
#4 Hot leg temp TR-68-43	_____ °F
#4 Cold leg temp TR-68-60	_____ °F
S.G. #1 Level (narrow range) LI-3-42	_____ %
S.G. #2 Level (narrow range) LI-3-55	_____ %
S.G. #3 Level (narrow range) LI-3-97	_____ %
S.G. #4 Level (narrow range) LI-3-110	_____ %

_____ / _____
Recorded By Date

DATA SHEET 5.1

Unit _____ Time _____ Date _____

S.G. #1 Level (wide range)
LR-3-43 Pen 1 _____ %

S.G. #2 Level (wide range)
LR-3-43 Pen 2 _____ %

S.G. #3 Level (wide range)
LR-3-98 Pen 1 _____ %

S.G. #4 Level (wide range)
LR-3-98 Pen 2 _____ %

S.G. #1 Pressure
PI-1-2A _____ psig

S.G. #2 Pressure
PI-1-9A _____ psig

S.G. #3 Pressure
PI-1-20A _____ psig

S.G. #4 Pressure
PI-1-27A _____ psig

S.G. #1 Feedwater flow
FI-3-35A _____ gpm

S.G. #2 Feedwater flow
FI-3-48A _____ gpm

S.G. #3 Feedwater flow
FI-3-90A _____ gpm

S.G. #4 Feedwater flow
FI-3-103A _____ gpm

S.G. #1 Steam flow
FI-1-3A _____ lbs/hr

S.G. #2 Steam flow
FI-1-10A _____ lbs/hr

_____ / _____
Recorded By Date

DATA SHEET 5.1

Unit _____ Time _____ Date _____

S.G. #3 Steam flow FI-1-21A	_____	lbs/hr
S.G. #4 Steam flow FI-1-28A	_____	lbs/hr
Loop #1 T-average TI-68-2E	_____	^{o}F
Loop #2 T-average TI-68-25E	_____	^{o}F
Loop #3 T-average TI-68-44E	_____	^{o}F
Loop #4 T-average TI-68-67E	_____ _____	^{o}F
Loop #1 Δ T TI-68-2D	_____	^{o}F
Loop #2 Δ T TI-68-25D	_____	^{o}F
Loop #3 Δ T TI-68-44D	_____ _____	^{o}F
Loop #4 Δ T TI-68-67D (0-100% = 0-55^{o}F Δ T)	_____	^{o}F
NIS Channel N-41	_____	%
NIS Channel N-42	_____	%
NIS Channel N-43	_____	%
NIS Channel N-44	_____	%

NOTE: Attach Computer Printout of Incore Thermocouple Temperature Map. Refer to Appendix A for the procedure for printing out of this map.

_____ / _____
Recorded By Date

DATA SHEET 5.3

Unit _____ Time _____ Date _____

Lowest of PI-68-340, 334A, 323A or 322A (PI-68-66A if below 1700 psig)	Highest Incore T/C	Computer Saturation Margin on Trend
Time = 0		

DATA SHEET 5.4

(To be plotted on graph paper and attached)

APPENDIX A

References

1. FSAR
2. Technical Specifications
3. Plant Operating Instructions EOI-5
   SOI-68.2

APPENDIX B

Test Deficiencies #_____

Test Deficiency

Recommended Resolution

Final Resolution

Originator _____ / _____
Signature Date

PORC Review of Final Resolution _____
Date

Approval of Final Resolution _____ / _____
Plant Superintendent Date

APPENDIX C

Procedure for Determining Core Power Level

APPENDIX C

Outline

I. Core Power Determination

A. Primary Side Calorimetric (Forced Circulation Only)

1. Reference (~ 550°F) Calorimetric (Before NC test)

a) Output used to adjust M/D Power Monitor Program's power conversion constant.

B. M/D Power Monitor Program

1. Power Conversion Constant Adjustment.

a) The output of the REF primary calorimetric will give a percent power output; this output must be input to the M/D Power-Monitor Program so that the program output will be in percent power and equal to the primary calorimetric output.

2. Power Monitoring

a) The M/D Power Monitor Program will calculate the integral power as seen by one pass of 5 or 6 detectors. After the output has been calibrated to be equal to the REF primary calorimetric it will be rerun up to once every 2 minutes or as necessary to continuously monitor core power.

APPENDIX C

CORE POWER DETERMINATION

PART A: Primary side calorimetric - Data Sheet C.1 (Forced Circulation)

C.1 Use two DVMs and measure the voltage at the test points specified for each loop as rapid as possible.

C.2 Calcuiate the ΔT; multiply that ΔT by the specific heat and the Westinghouse best estimate flow rate of the core average temperature (Table C-1). (Special Test No. 9 uses wide range ΔT so a correction factor is required to compensate for pump heating, refer to Appendix D of ST-9A).

C.3 Sum the loop heat rates and convert to a percent reactor power. The output is used in Part B.

APPENDIX C

Core Power Determination

PART B: M/D Power Monitor Program

1. Set up the movable detector system for a 1 pass partial core flux map as per TI-53. Select flux thimbles as per the table below for the flux map.

Drive	10-Path Position	Core Location
A	10	L-5
B	10	L-11
C	10	E-5
D	10	E-11
E	6	J-8
F	8	P-9

These positions may be altered by the test engineer, based upon low-power physics testing results and previous special testing experience.

2. Determine the detector normalization constants and enter them into the P-250 as follows:

   a) Enter a value of 1.0 into the P-250 for the addresses shown in the table below.

   b) With all 5-path selector switches set to normal, run a flux trace.

   c) With all 5-path selector switches set to Emergency, run a second flux trace.

   d) Determine the detector normalization constants from Data Sheet C.2.

APPENDIX C

Core Power Determination

PART B: (Continued)

e) Enter these detector normalization constants into the P-250 as shown in the table below.

Drive	P-250 Address
A	K0908
B	K0909
C	K0910
D	K0911
E	K0912
F	K0913

3. Verify that the P-250 parameters listed in the following table have the proper value and that the P-250 time and date are current. Update as required.

Address	Value	Function
K0901	1	Set the power normalization factor
K5525	1	Selects the modified "Flux Map Print" programs
K0900	0	Initiated Pass Number
K0864	Variable(1)	Calibration Constant for M/D Power Monitor

(1) Variable: The value entered is a ratio of the Primary Calorimetric Indicated Power (Item B on Data Sheet C.1) to the M/D calculated power (U0906) times the current value entered in (K0864). If no value has been entered into (K0864) enter 0.25.

$$\text{New (K0864)} = \text{Current (K0864)} \times \frac{\text{Item \#8 Data Sheet C.1}}{\text{(U0906)}}$$

APPENDIX C

PART B: (Continued)

4. For power determination, obtain a partial core flux map as per TI-53. The M/D's need not be withdrawn between passes, and passes may be repeated as often as a power determination is required.

NOTE: The calculated power (U0906) is printed after each pass and may be trended by the P-250 if desired. The individual detector normalized integrals are also printed.

TABLE C-1

Temp ^{o}F	C_p (1) BTU/lbm^{o}F	m^{o} lbm/hr
556	1.260	3.6448×10^7
554	1.255	3.6553×10^7
552	1.250	3.6659×10^7
550	1.245	3.6765×10^7
548	1.240	3.6862×10^7
546	1.236	3.6959×10^7
544	1.231	3.7057×10^7
542	1.226	3.7155×10^7
540	1.221	3.7254×10^7
538	1.217	3.7348×10^7
536	1.213	3.7443×10^7
534	1.209	3.7538×10^7
532	1.206	3.7633×10^7
530	1.202	3.7729×10^7

(1) These values are from the 1967 ASME Steam Tables. Values are for a pressure of 2250 psia.

APPENDIX C

Data Sheet C.1

Date _____ Time _____ Unit _____ Power _____ Tavg _____ °F

Item #	Calculation Procedure	Units	Loop 1 R2/TP-411J	Loop 2 R6/TP-421J	Loop 3 R10/RP-431J	Loop 4 R13/RP-441J
1	Loop ΔT - Inservice (at test point)	Volts				
2	Loop ΔT = (#1) x (1)	°F				
3	Loop ΔH = (#2) x Cp (from Table C.1)	BTU/lbm				
4	Loop RCS Flow (from Table C.1)	10^6 lbm/hr				
5	Loop Reactor Power = (#3) x (#4)	10^6 BTU/hr				
6	Total Reactor Power = (#5) Loop 1 + Loop 2 + Loop 3 + Loop 4	10^6 BTU/hr				
7	Reactor Power = (#6) x 0.29307	MWT				
8	% Reactor Power = (#7) x 0.02932	%				

(1) Conversion factor for ΔT obtained from scaling document.

Remarks:

Date By: _____

Checked By: _____

APPENDIX C

DATA SHEET C.2

A_N = _____ B_N = _____ C_N = _____ D_N = _____ E_N = _____ F_N = _____

A_E = _____ B_E = _____ C_E = _____ D_E = _____ E_E = _____ F_E = _____

$N_A = 1.00$

$$N_B = \frac{A_N}{B_N} = \frac{N_A A_E}{B_N} = \text{_____}$$

$$N_C = \frac{A_N}{C_N} = \frac{N_B B_E}{C_N} = \text{_____}$$

$$N_D = \frac{A_N}{D_N} = \frac{N_C C_E}{D_N} = \text{_____}$$

$$N_E = \frac{A_N}{E_N} = \frac{N_D D_E}{E_N} = \text{_____}$$

$$N_F = \frac{A_N}{F_N} = \frac{N_E E_E}{F_N} = \text{_____}$$

Definitions:

A_N, B_N, C_N, D_N, E_N, F_N = Normalized integral from summary map for each detector in a normal path in the first pass

A_E, B_E, C_E, D_E, E_E, F_E = Normalized integral from summary map for each detector in an emergency path in the second pass

N_A, N_B, N_C, N_D, N_E, N_F = Detector normalization factor for each detector

Remarks:

Data By: _____ Date _____

APPENDIX C

PART C: Using Thermocouples

The incore thermocouples can be used as an indication of both core flow distribution and power shifts during natural circulation.

Prior to running a thermocouple map or trending the eight quadrant tilts (four center line and four diagonal tilts) the following should be verified:

K0701-K0765 = 1, For the flow mixing factors

K5501 = 0, Indicates the measured core ΔT is unreliable

K0791 = 0.075, Core bypass flow fraction

K5010 = 8, Tells thermocouple program how many readings of thermocouples are required for averaging before calculation is done. This in turn sets the running frequency of the Thermcouple Averaging Program at 1, 2, . . . X 8 seconds or 64 seconds for us.

The thermcouple programs breaks the core down into eight quadrants--four centerline and four diagonal quadrants (see Figure C-1). Quadrants 1-4 can be directly correlated with the excore detectors but quadrants 5-8 cannot.

The quadrant tilts are indicative of power shifts and should be trended at approximately a 2-minute frequency. The following addressable values are the quadrant tilts:

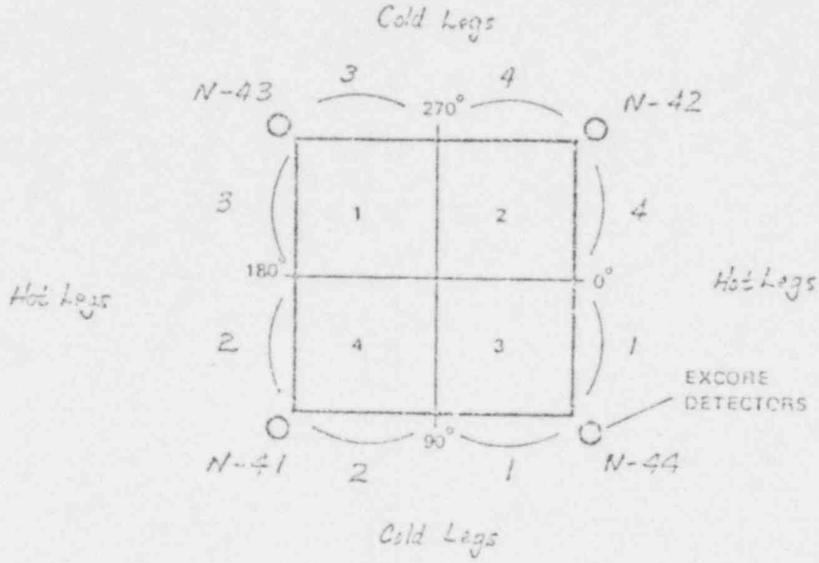
Quadrant	Addressable Value
1	U1159
2	U1160
3	U1161
4	U1162
5	U1151
6	U1152
7	U1153
8	U1154

A Short Form Map should be run periodically or upon request from the test engineer as an indication of core flow distribution. It should be put on the Utility Typewriter if possible. The P-250 Operator's Console Reference Manual provides instructions for obtaining thermocouple maps.

The trend output and Short Form Maps should be attached to this procedure at the end of the test.

APPENDIX C

CENTER-LINE QUARTER-CORE SYMMETRY



DIAGONAL QUARTER CORE SYMMETRY

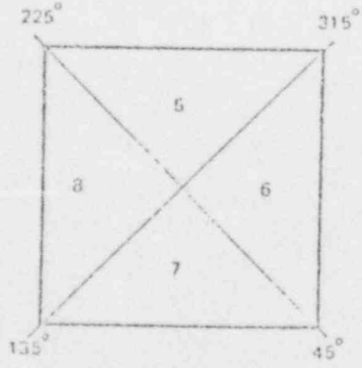


Figure C-1

APPENDIX D

Procedure For Use Of Computer System For Data Collection

The following parameters will be monitored during this test using the plant computer system.

Parameter	Computer Point
Pressurizer Pressure	P0480A
Pressurizer Level	L0480A
RCS Loop 1 Hot Leg Temperature	T0419A
RCS Loop 1 Cold Leg Temperature	T0406A
RCS Loop 2 Hot Leg Temperature	T0439A
RCS Loop 2 Cold Leg Temperature	T0426A
RCS Loop 3 Hot Leg Temperature	T0459A
RCS Loop 3 Cold Leg Temperature	T0446A
RCS Loop 4 Hot Leg Temperature	T0479A
RCS Loop 4 Cold Leg Temperature	T0466A
Steam Generator 1 Pressure	P0400A
Steam Generator 1 Narrow Range Level	L0400A
Steam Generator 2 Pressure	P0420A
Steam Generator 2 Narrow Range Level	L0420A
Steam Generator 3 Pressure	P0440A
Steam Generator 3 Narrow Range Level	L0440A
Steam Generator 4 Pressure	P0460A
Steam Generator 4 Narrow Range Level	L0460A
Power Range Channel 1 (Quadrant 4)	N0049A
Power Range Channel 2 (Quadrant 2)	N0050A
Power Range Channel 3 (Quadrant 1)	N0051A
Power Range Channel 4 (Quadrant 3)	N0052A
Incore Thermocouples	T0001A through T0065A

APPENDIX D

The computer trend typewriter will be used to monitor the following computer points. (Additional points may be added as required by the test director).

BLOCK 1

Column	Point	Column	Point	Column	Point
1	P0480A	7	T0459A	13	P0420A
2	L0480A	8	T0446A	14	L0420A
3	T0419A	9	T0479A	15	P0440A
4	T0406A	10	T0466A	16	L0440A
5	T0439A	11	P0400A	17	P0460A
6	T0426A	12	L0400A	18	L0460A

BLOCK 2

Column	Point	Column	Point
1	N0049A	7	T0017A
2	N0050A	8	T0043A
3	N0051A	9	T0059A
4	N0052A	10-13	Hottest T/C from each core Quadrant
5	T0002A	14-18	As Required
6	T0013A		

To initially clear each data block perform the following step for each block to be used.

1. Push DIGITAL TREND button
2. Select block number (1 to 6) on keyboard
3. Push VALUE 1 button
4. Select 0 on keyboard
5. Push VALUE 2 button
6. Push STOP button

Repeat the above 6 steps for each data block to be used.

NOTE: A Block Trend Error message will occur if the data block is initially clear.

To set up the data blocks, perform the following series of steps for each point to be monitored.

1. Push the DIGITAL TREND button
2. Select the point address (i.e. P0480A) on the alphanumeric keyboard
3. Push ADDRESS button
4. Select block number (1 to 6) on keyboard.
5. Push VALUE 1 button
6. Select column number (1 to 18) on keyboard
7. Push VALUE 2 button
8. Push START button

APPENDIX D

Once the blocks are set up they can be initiated by performing the following steps for each block.

1. Push DIGITAL TREND button.
2. Select block number (1 to 6) on keyboard
3. Push VALUE 1 button
4. Select internal number 0 = 30 sec., 1 = 1 minute, 2 = 2 minute, etc.) The 30-second interval is recommended for the duration of the test transient
5. Push VALUE 3 button
6. Push START button

If it is necessary to change the trend interval of a block or trend, perform the following.

1. Push DIGITAL TREND button
2. Select block number (1 to 6) on keyboard
3. Push VALUE 1 button
4. Select new interval number (0 = 30 sec., 1 = 1 min., 2 = 2 min., etc) on keyboard
5. Push VALUE 3 button
6. Push START button

To stop trending or block perform the following:

1. Push DIGITAL TREND button
2. Select block number (1 to 6) on keyboard
3. Push VALUE 1 button
4. Select C on keyboard
5. Push VALUE 3 button
6. Push STOP button

In addition to the data recorded on the trend typewriter, the following points will be monitored on analog trend recorded.

T0056A (Core exit temp).
Others as needed (Recommend pressurizer pressure, steam generator level (WR) and steam generator pressure).

After selecting the per to be used to record a value, ensure that it is cleared by performing the following steps.

1. Push ANALOG TREND function button
2. Select per number (1 to 12) on keyboard
3. Push VALUE 1 button
4. Push STOP button

APPENDIX D

To start an analog trend perform the following steps.

1. Push ANALOG TREND function button
2. Select the computer point address (i.e. T0043A) on the alphanumeric keyboard
3. Push ADDRESS button
4. Select per number (1 to 12) on keyboard
5. Push VALUE 1 button
6. Select per position on keyboard. This is the minimum value of the parameter to be monitored
7. Select range on the keyboard
8. Push VALUE 3 button
9. Push START button

Repeat these steps until all of the desired analog points are being recorded.

Prior to initiation of the transient, and as required thereafter, incore thermocouple maps will be recorded at the programmers console in the computer room. To initiate an incore thermocouple map at that location, perform the following steps.

1. Push IN-CORE T/C MAP function button
2. Select 25 on keyboard for short-form current map
3. Push VALUE 1 button
4. Select output device code number 20 for programmers console on keyboard
5. Push VALUE 2 button
6. Select 1 on keyboard for a short-form map
7. Push VALUE 3 button
8. Push START button

APPENDIX E

Safeguard Blocking Procedure

The first step blocks automatic initiation of a safety injection. The safety injection alarm, manual S.I handswitch, and the reactor trip portion of the protection logic will remain in operation. If conditions exist that would normally initiate a safety injection; (1) the safety injection alarm will initiate telling the operator that the condition exists and what the problem is. (2) a reactor trip will take place automatically. (3) a safety injection can be initiated manually from the switch in the control room if conditions warrant.

1. Install temporary jumpers and temporary alteration control tags to logic cards A216, test point 1, to the logic ground on the logic test panels in R-47 and R-50.

   NOTE: These jumpers will be specially made for this purpose and installed by an instrument mechanic.

   R-47 Panel Performed by: _____ /_____

   Verified by: _____ /_____

   R-50 Panel Performed by: _____ /_____

   Verified by: _____ /_____

Procedure for blocking automatic actuation of a safety injection on high steamline Delta-P. This block will prevent a reactor trip from occuring during the natural circulation tests from high ΔP caused by degraded test conditions. (This block will also defeat all ΔP SI alarms).

2. Verify status lights 1-XX-55-6B/1, 2, 3, 4, 25, 26, 27, 28, 50, 51, 73, 76 are all clear prior to starting blocking procedure.

3. Move test trip switch PS-515A in 1-R-7 to the trip position and verify the amber light above the switch comes on.

   Performed by: _____ /_____

   Verified by: _____ /_____

CAUTION: In the next step, and all following steps in which a voltage is being applied to the indicated terminals, ensure the applied voltage is of the same polarity as the terminals. This check should be done for every step that a voltage source is applied. Failure to apply the correct polarity will ground the rack power supply. (This problem can be avoided if only the hot wire from the voltage source in the rack is applied to the first terminal indicated in each step [the lower numbered terminal]. The

APPENDIX E

ground will already be made up through the trip switch). The wire on the rack side of the terminal block must be lifted and taped for the terminal point where the jumper wire is connected The TACF tag will be attached to the bistable switch and the TACF must note the jumper and the lifted wire.

NOTE: Orange "Out of Service" stickers should be placed on all status/alarm windows as the 120V source is connected.

4. Lift and tape the wire on the rack side of terminal L-9 in the rear of 1-R-7. Apply a 120-VAC source to terminals L-9 and L-10 in the rear of 1-R-7 and verify 1-XX-55-6B/25 is clear.

Performed by: _____ /_____

Verified by: _____ /_____

5. Move test trip switch PS-515B in 1-R-7 to the trip position and verify the amber light above the switch comes on.

Performed by: _____ /_____

Verified by: _____ /_____

6. Lift and tape the wire on the rack side of terminal L-7 in the rear of 1-R-7. Apply a 120-VAC source to terminals L-7 and L-8 in the rear of 1-R-7 and verify 1-XX-55-6B/27 is clear.

Performed by: _____ /_____

Verified by: _____ /_____

7. Move test trip switch PS-516C in 1-R-12 to the trip position and verify the amber light above the switch comes on.

Performed by: _____ /_____

Verified by: _____ /_____

8. Lift and tape the wire on the rack side of terminal L-5 in the rear of 1-R-7. Apply 120-VAC source to terminals L-5 and L-6 in the rear of 1-R-12 and verify 1-XX-55-6B/73 is clear.

Performed by: _____ /_____

Verified by: _____ /_____

APPENDIX E

9. Move test trip switch PS-516D in 1-R-12 to the trip position and verify the amber light above the switch comes on.

Performed by: _____ /_____

Verified by: _____ /_____

10. Lift and tape the wire on the rack side of terminal L-7 in the rear of 1-R-12. Apply 120-VAC source to terminals L-7 and L-8 in the rear of 1-R-12 and verify 1-XX-55-6B/76.

Performed by: _____ /_____

Verified by: _____ /_____

11. Move test trip switch PS-525B in 1-R-8 to trip position and verify the amber light above the switch comes on.

Performed by: _____ /_____

Verified by: _____ /_____

12. Lift and tape the wire on the rack side of terminal L-7 in the rear of 1-R-8. Apply 120-VAC source to terminals L-7 and L-8 and verify 1-XX-55-6B/28 is clear.

Performed by: _____ /_____

Verified by: _____ /_____

13. Move test trip switch PS-525A in 1-R-8 to the trip position and verify the amber light above the switch comes on.

Performed by: _____ /_____

Verified by: _____ /_____

14. Lift and tape the wire on the rack side of terminal L-9 in the rear of 1-R-8. Apply 120-VAC source to terminals L-9 and L-10 and verify that XX-55-6B/26 is clear.

Performed by: _____ /_____

Verified by: _____ /_____

15. Move test trip switch PS-526D in 1-R-11 to the trip position and verify the amber light above the switch comes on.

Performed by: _____ /_____

Verified by: _____ /_____

APPENDIX E

16. Lift and tape the wire on the rack side of terminal L-7 in the rear of 1-R-11. Apply 120-VAC source to terminals L-7 and L-8 in the rear of 1-R-11 and verify that XX-55-6B/51 is clear.

Performed by: _____ /_____

Verified by: _____ /_____

17. Move test trip switch PS-526C in 1-R-11 to the trip position and verify the amber light above the switch comes on.

Performed by: _____ /_____

Verified by: _____ /_____

18. Lift and tape the wire on the rack side of terminal L-5 in the rear or 1-R-11. Apply a 120-VAC source to terminals L-5 and L-6 and verify 1-XX-55-6B/50 is clear.

Performed by: _____ /_____

Verified by: _____ /_____

Temporary Modification to High Steam Flow Coincident with Low S.G. Pressure or Low-Low T_{avg} Safety Injection

19. Verify annunciators XA-55-6A/30 and XA-55-6A/31 are clear or can be cleared.

Performed by: _____ /_____

Verified by: _____ /_____

NOTE: If the alarms will not clear, do not proceed with this modification as a reactor trip may result. The input bistables should be checked and the source of the problem corrected.

20. Move test trip switch TS412D in R-2 to the trip position and verify the amber light above the switch comes on.

Performed by: _____ /_____

Verified by: _____ /_____

21. Lift and tape the wire on the rack side of terminal M-3 in the rear of 1-R-2. Apply a 120-VAC source to terminals M-3 and M-4 and verify XA-55-6A/30 will clear.

Performed by: _____ /_____

Verified by: _____ /_____

APPENDIX E

22. Move test trip switch TS-422D in R-6 to the trip position and verify the amber light above the switch comes on.

Performed by: _____ /_____

Verified by: _____ /_____

23. Lift and tape the wire on the rack side of terminal M-3 in the rear of 1-R-6. Apply a 120-VAC source to terminals M-3 and M-4 and verify XA-55-6A/30 will clear.

Performed by: _____ /_____

Verified by: _____ /_____

24. Move test trip switch TS432D in R-10 to the trip position and verify the amber light above the switch comes on.

Performed by: _____ /_____

Verified by: _____ /_____

25. Lift and tape the wire on the rack side of terminal M-3 in the rear of 1-R-10. Apply a 120-VAC source to terminals M-3 and M-4 and verify XA-55-6A/30 will clear.

Performed by: _____ /_____

Verified by: _____ /_____

26. Move test trip switch TS-442D in R-13 to the trip position and verify the amber light above the switch comes on.

Performed by: _____ /_____

Verified by: _____ /_____

27. Lift and tape the wire on the rack side of terminal M-3 in the rear of 1-R-13. Apply a 120-VAC source to terminals M-3 and M-4 and verify XA-55-6A/30 will clear.

Performed by: _____ /_____

Verified by: _____ /_____

NOTE: The T_{avg} inputs to the high steam flow S.I and steam dump interlock are now blocked. The next steps will trip the steam flow inputs to the high steam flow Safety Injection signal so that an S.I. signal will be initiated on low steam generator pressure alone (600 psig). (This would result in a reactor trip, an S. I. alarm, but no S. I. initiation.)

APPENDIX E

28. Move test trip switch FS512B in R-3 to the trip position and verify the amber light and annunciator XA-55-6B/2 come on.

Performed by: _____ /_____

Verified by: _____ /_____

29. Move test trip switch FS522B in R-3 to the trip position and verify the amber light and annunciator XA-55-6B/ come on.

Performed by: _____ /_____

Verified by: _____ /_____

NOTE: These two trips will supply the 2 out of 4 logic required to get a Safety Injection Signal.

30. Apply Temporary Alteration Control Tags forms to all the above test trip switches to ensure that they remain in the trip position. Damage to the bistable could occur if the switch is moved back to the normal position. Record the temporary alteration numbers below:

RACK	TEST SWITCH	TEMP ALT. NO.
R-7	PS515A	_____ /_____
R-7	PS515B	_____ /_____
R-12	PS516C	_____ /_____
R-12	PS516D	_____ /_____
R-8	PS525B	_____ /_____
R-8	PS525A	_____ /_____
R-11	PS526D	_____ /_____
R-11	RS526C	_____ /_____
R-2	TS412D	_____ /_____
R-6	TS422D	_____ /_____
R-10	TS432D	_____ /_____
R-13	TS442D	_____ /_____
R-3	FS512B	_____ /_____
R-3	FS522B	_____ /_____

To return the steamline Delta-P S.I. to normal condition, the following steps should be followed.

APPENDIX E

NOTE: The orange "Out of Service" stickers should be removed from the alarm/status window as each bistable is put back in service.

31. Remove the 120-VAC source from L-5 and L-6 in 1-R-11. Reterminate wire on L-5.

Performed by: _____ /_____

Verified by: _____ /_____

32. Move test trip switch PS-526C in 1-R-11 to the normal position and verify the amber light above the switch and 1-XX-55-6B/50 are clear.

Performed by: _____ /_____

Verified by: _____ /_____

33. Remove the 120-VAC source from L-7 and L-8 in 1-R-11. Reterminate wire on L-7.

Performed by: _____ /_____

Verified by: _____ /_____

34. Move test trip switch PS-526D in 1-R-11 to the normal position and verify the amber light above the switch and 1-XX-55-6B/51 are clear.

Performed by: _____ /_____

Verified by: _____ /_____

35. Remove the 120-VAC source from L-9 and L-10 in 1-R-8. Reterminate wire on L-9.

Performed by: _____ /_____

Verified by: _____ /_____

36. Move test trip switch PS-525A in 1-R-8 to the normal position and verify the amber light and 1-XX-55-6B/26 are clear.

Performed by: _____ /_____

Verified by: _____ /_____

37. Remove the 120-VAC source from L-7 and L-8 in 1-R-8. Reterminate wire on L-7.

Performed by: _____ /_____

Verified by: _____ /_____

APPENDIX E

38. Move test trip switch PS-525B in 1-R-8 to the normal position and verify the amber light above the switch and 1-XX-5-6B/28 are clear.

Performed by: _____ /_____

Verified by: _____ /_____

39. Remove the 120-VAC source from terminals L-7 and L-8 in 1-R-12. Reterminate wire on L-7.

Performed by: _____ /_____

Verified by: _____ /_____

40. Move test trip switch PS-516D in 1-R-12 to the normal position and verify the amber light above the switch and 1-XX-55-6B/76 are clear.

Performed by: _____ /_____

Verified by: _____ /_____

41. Remove the 120-VAC source from terminals L-5 and L-6 in 1-R-12. Reterminate wire on L-5.

Performed by: _____ /_____

Verified by: _____ /_____

42. Move test trip switch PS-516C in 1-R-12 to the normal position and verify the amber light above the switch and 1-XX-55-6B/73 are clear.

Performed by: _____ /_____

Verified by: _____ /_____

43. Remove the 120-VAC source from terminals L-7 and L-8 in 1-R-7. Reterminate wire on L-7.

Performed by: _____ /_____

Verified by: _____ /_____

44. Move test trip switch PS-515B in 1-R-7 to the normal position and verify the amber light and 1-XX-55-6B/27 are clear.

Performed by: _____ /_____

Verified by: _____ /_____

APPENDIX E

45. Remove the 120-VAC source from terminals L-9 and L-10 in 1-R-7. Retermi-nate wire on L-9.

Performed by: _____ / _____

Verified by: _____ / _____

46. Move test trip switch PS-515A to the normal position and verify the amber light above the switch and 1-XX-55-6B/25 are clear.

Performed by: _____ / _____

Verified by: _____ / _____

NOTE: At this point the steamline Delta-P safety injection is in a normal operating mode.

To return the high steam flow coincident with low steam generator pressure or low-low T_{avg} to normal, perform the following steps.

47. Move test trip switch FS522B in R-3 to the normal position and verify the amber light goes out and XA-55-6B/9 will clear.

Performed by: _____ / _____

Verified by: _____ / _____

48. Move test trip switch FS512B in R-3 to the normal position and verify the amber light goes out and XA-55-6B/2 will clear.

Performed by: _____ / _____

Verified by: _____ / _____

49. Remove the 120-VAC source from terminals M-3 and M-4 in R-13. Retermi-nate wire on M-3.

Performed by: _____ / _____

Verified by: _____ / _____

50. Move test trip switch TS442D in R-13 to the normal position and verify the amber light goes out and XA-55-6A/30 will clear.

Performed by: _____ / _____

Verified by: _____ / _____

APPENDIX E

51. Remove the 120-VAC source from terminals M-3 and M-4 in R-10. Reterminate wire on M-3.

Performed by: _____ /_____

Verified by: _____ /_____

52. Move test trip switch TS432D in R-10 to the normal position and verify the amber light goes out and XA-55-6A/30 will clear.

Performed by: _____ /_____

Verified by: _____ /_____

53. Remove the 120-VAC source from terminals M-3 and M-4 in R-6. Reterminate wire on M-3.

Performed by: _____ /_____

Verified by: _____ /_____

54. Move test trip switch TS442D in R-6 to the normal position and verify the amber light goes out and XA-55-6A/30 will clear.

Performed by: _____ /_____

Verified by: _____ /_____

55. Remove the 120-VAC source from terminals M-3 and M-4 in R-2. Reterminate wire on M-3.

Performed by: _____ /_____

Verified by: _____ /_____

56. Move test trip switch TS412D in R-2 to the trip position and verify the amber light comes on and XA-55-6A/30 will clear.

Performed by: _____ /_____

Verified by: _____ /_____

APPENDIX E

57. Remove the Temporary Alteration Tags on the following test trip switches:

RACK	TEST SWITCH	TEMP ALT. NO.
R-7	PS515A	_____ / _____
R-7	PS515B	_____ / _____
R-12	PS516C	_____ / _____
R-12	PS516D	_____ / _____
R-8	PS525B	_____ / _____
R-8	PS525A	_____ / _____
R-11	PS526D	_____ / _____
R-11	RS526C	_____ / _____
R-2	TS412D	_____ / _____
R-6	TS422D	_____ / _____
R-10	TS432D	_____ / _____
R-13	TS442D	_____ / _____
R-3	FS512B	_____ / _____
R-3	FS522B	_____ / _____

58. Remove the jumpers and the Temporary Alteration Tags from logic cards A216, test point 1, to the logic ground on the logic test panels in R-47 and R-50.

R-47 Panel Performed by: _____ / _____
Verified by: _____ / _____

R-50 Panel Performed by: _____ / _____
Verified by: _____ / _____

NOTE: All reactor safeguard systems modified for the special startup tests are back in a normal configuration at this time.

APPENDIX F

Technical Specifications Exceptions

The table below identifies those technical specification items which are temporarily bypassed or require special test exceptions to the limiting conditions for operation during the performance of this and all other special tests.

TECHNICAL SPECIFICATION	1 Natural Circulation	2 Loss of Offsite Power	3 Natural Circ. w/o Przr Htrs.	4 Natural Circ. Isolate SG	5 Natural Circ. Reduced Pressure	6 Charging and Letdown Cooldown	7 Blackout	8 Stagnant Start	9A Forced Flow Cooldown	9B Boron Mixing Cooldown
Containment HI Pressure SI (3.3.2.1)	X	X	X	X	X	X	X	X	X	X
Safety Limits (2.1.1)	X	X	X	X	X	X	X	X		X
$\overline{OP\Delta T}$ (3.3.1) Inoperable because of low flow	X	X	X	X	X		X	X	X	X
$\overline{OT\Delta T}$ (3.3.1) Inoperable because of low flow	X	X	X	X	X		X	X	X	X
Minimum temperature (3.1.1.4)				X				X	X	X
Moderator temperature coefficient (3.1.1.3)				X				X	X	X
Steamline ΔP SI (3.3.2.1) bypassed	X	X	X	X	X	X	X	X	X	X
High Steamflow coincidental w/low steamline pressure or low-low T_{avg} SI										
Reset flow to 0% and T_{avg} blocked	X	X	X	X	X	X	X	X	X	X
Reset low steamline pressure				X					X	X
Low pressurizer pressure SI (3.3.2.1)	X	X	X	X	X	X	X	X	X	X
SG level low AFW start reset (3.3.2.1)		X					X			
Pressurizer (3.4.4)			X		X		X			
UHI (3.5.1.2)	X	X	X	X	X	X	X	X	X	X
AFW (3.7.1.2)		X					X			
Diesel Gens. (3.8.1.1)		X					X			
A.C. Electrical Boards (3.8.2.1)		X					X			
Batteries (3.8.2.3)		X					X			
RCS Flowrate (3.2.3)	X	X	X	X	X		X	X		X
Control Rod Insertion Limits (3.1.3.6)	X	X	X	X	X		X	X		
Reactor Coolant Loops Normal Operation (3.4.1.2)	X	X	X	X	X		X	X		X

TABLE 1

Loop Flow and Core ΔT for
Various Power Levels and
Isolation Configurations

(Computer Estimates)

	No. of Loops Operating (Nat. Circ.)			
Power Level	4	3	2	1
.5%	W_L = - ΔT = 10.3	W_L = 3.6 ΔT = 12.5	W_L = 4.1 ΔT = 16.4	W_L = 5.2 ΔT = 26
.75%	W_L = 3.7 ΔT = 13.5	W_L = 4.1 ΔT = 16.3	W_L = 4.7 ΔT = 21.4	W_L = 5.9 ΔT = 34
1%	W_L = 4.1 ΔT = 16.3	W_L = 4.5 ΔT = 19.8	W_L = 5.2 ΔT = 26	W_L = 6.5 ΔT = 41
1.5%	W_L = 4.7 ΔT = 21.4	W_L = 5.2 ΔT = 26	W_L = 5.9 ΔT = 34	W_L = 7.5 ΔT = 54
2%	W_L = 5.2 ΔT = 26	W_L = 5.7 ΔT = 31.4	W_L = 6.5 ΔT = 41	W_L = 8.2 ΔT = 65.4
2.5%	W_L = 5.6 ΔT = 30.1	W_L = 6.2 ΔT = 36.5	W_L = 7.1 ΔT = 47.1	W_L = 8.9 ΔT = 75.9
3%	W_L = 5.9 ΔT = 34	W_L = 6.5 ΔT = 41.2	W_L = 7.5 ΔT = 54	W_L = 9.7 ΔT = 85.7

NOTE: W_L is % of 97,000 gpm flow through operable loop.

ΔT = Loop ΔT in °F.